

VAD 5310 and VAD 5350

Optical multiplexers/transceivers for video, data, audio and contact closure signals

USER MANUAL

1. General description

VAD 5310 and 5350 TX/RX modules offer unidirectional transmission of one video signal, as well as two data, two audio and two contact closure channels, all full duplex, transparent and independent, over one optical fibre. By means of software, the video channel can be set to transparent mode.

A VAD 5310 TX/RX transceiver pair uses optical wavelengths of 1300/850 nm and works with multimode fibre, while a VAD 5350 system utilizes 1310/1550 nm over single-mode fibre.

The data interfaces are biphase compatible RS-485 (2 or 4-wire selectable)/RS-422, and RS-232; the RS-485 output can be configured for current loop applications. The 16-bit digitized audio channels are 4-wire, with selectable input impedance. Contact closures are normally open. Data interface and audio options are selectable using internal dip switches and jumpers on the circuit boards.





Access to the six ancillary channels is through the three modular ports; see tables 1 and 3.

Front panel LEDs indicate power, sync, data input and video I/O status.

Any 7TE VAD unit will slot into the backplane of an Optelecom-NKF MC 11 or similar power supply cabinet; in MC XX EB-2-cabinets, they can be controlled through SmartNet management (SNM). The stand-alone VAD/SA (see supplementary manual) needs a separate 12 V_{DC} power supply (see also section 5).

2. Indications and connectors

Front panel features of the VAD 5310 and VAD 5350 TX/RX are listed in table 1 below; see fig. 1.

VAD TX	
	optical video&data out/data in
	video input
VAD RX	
	optical video&data in/data out
	video output
VAD TX and RX	
I/O 1 (modular socket)	audio 1, contact closure 1
I/O 2 (modular socket)	audio 2, contact closure 2
I/O 3 (modular socket)	RS-485 (422), RS-232
Status indicator LEDs	
*DC (green)	DC power OK
*NV (red)	no video on TX input, RX output
*SYNC red	no local sync, or RX optical low
orange	remote: no sync, or optical low
green	all sync OK
*D1 green/red	RS-485 0/1 data on input
*D2 green/off	RS-232 0/1 data on input

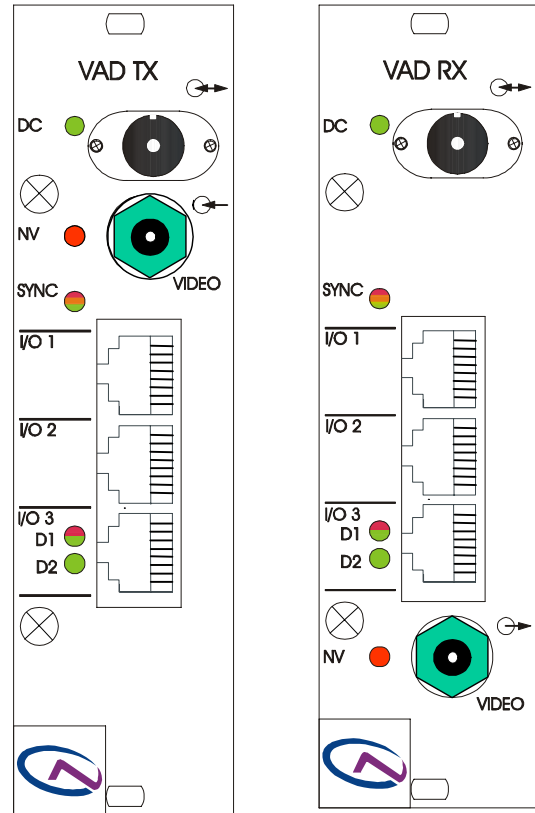


Figure 1. VAD 5350 TX (left) and RX front panels

Table 1. VAD 5310/5350 front indications and connectors

3. Configuration and installation

Interface selection and configuration options are available by setting switches and jumpers on the circuit boards (cf. figures 2a, b). To access these parts, open each unit by taking out the two Phillips head screws indicated in figure 1.

A VAD board has two adjoining dip switch blocks, with 4 and 8 switches, respectively. The first switch of each block and the ON positions are indicated in figures 2a, b.

The jumper pin sets A and B control audio input impedance; jumper C regulates the impedance of the RS-485 data output (see below).

Data interface selection: the RS-4xx interface type available on port I/O3 involves setting dip switches in the 4-fold block as per table 2.

Interface → Switch ↓	RS-485 2-wire	RS-485 4-wire*)	RS-422
1	OFF	OFF	ON
2	OFF	ON	OFF

Table 2. Dip switch settings (*= default)



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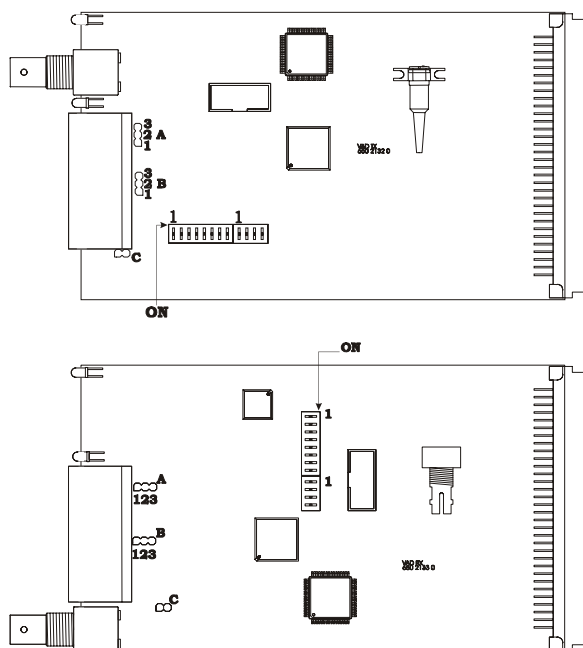


Figure 2a,b. VAD 5300 TX and RX circuit boards with dip switches and jumpers A, B, C (see tables 2 and 3).

Current loop I/O: The RS-485 output can be made suitable for current loop applications by pulling a 2-pin jumper (C) from the board, thus inserting a resistor into the non-inverting data line. *Current loop I/O should use only non-inverting lines and signal ground. The inverting lines [B or -] are not to be connected.*

RS-485 line biasing: In most cases, the RS-485 data interface will work with the default settings. If however data line biasing is used by other equipment connected to the VAD 51x0 TX, biasing impedances may need to be applied and dwell times set. With the other dip switches configured for RS-485 mode, the eightfold switch bank on the VAD TX and RX circuit boards (see figures 2a,b) gives access to two bias impedance values for both input and inverting input (see table 3 below).

Switch	Function (RS-485 mode set)
1-3	dwell time select, see table 4
4 ON	bias of inverting input 390 Ω (tied to +5V)
5 ON	bias of inverting input 10 k Ω (tied to +5 V)
6 ON	line termination 120 Ω
7 ON	bias of input 10 k Ω (tied to GND)
8 ON	bias of input 390 Ω (tied to GND)

Table 3. Setting bias, dwell time and line termination

Please note that the 'soft zero' biasing method used ties the *inverting* input to the higher voltage, while the biasing resistor of the normal input is tied to signal ground. This will provide a well-defined bus state when no driver is active.

The first three dip switches of the 8-fold block on the circuit boards (see figures 2a, b) are used to configure the tristate/dwell timing if connected to a biased RS-485 interface, to help signify the end of transmission (table 4). Dwell time is approximately 10*bit length or slightly longer.

Depending on the actual data rate, switches 1-3 should then be set as per table 4 (please read the notes below). Default is all three switches off.

Switch			Code	Dwell time ($\pm 7\%$)	Data rate (bit/s)
1	2	3			
OFF	OFF	OFF	0	*	0-max
OFF	OFF	ON	1	**	0-max
OFF	ON	OFF	2	0.16 ms	≥ 64000
OFF	ON	ON	3	0.32 ms	38400
ON	OFF	OFF	4	0.64 ms	19200
ON	OFF	ON	5	1.28 ms	9600
ON	ON	OFF	6	2.54 ms	4800
ON	ON	ON	7	5.12 ms	≤ 2400

*) hardware tri-state detect (1V differential sense, **not to be used together with line-biasing**)

**) logic high in the data directly drives the output enable (I.E. no delay)

Table 4. Switch settings for biased RS-485 interfacing. Settings 1-7 all need bias resistors to define zero.

Notes on dwell times:

- When in doubt about which of two dwell times to select, please use the longer of the two.
- Settings 1-7 will only work if the lines are biased to a 'soft zero'.
- The dwell timing uses the rising edges of input data to (re)start a timer which enables transmission. This way, a stuck line will not hang a bus.
- Different dwell times for TX and RX may be used. A mix of hardware-tristate-detect on one side and dwell-time on the other side is also feasible.
- The setting of tristate/dwell time in a unit does affect the data fed into that unit, i.e. the way data is output at the remote unit.

RS-485 line termination: Line termination impedance may be set to low using dip switch 6.

Audio port impedance: Audio input impedance in the VAD can be set by moving jumpers A or B on the circuit board (figs. 2a, b): a jumper on pins 1-2 will select high impedance for that port (default).

Provide the units with power and connect appropriate cabling (twisted pair for long electrical links). Through-connecting the signal ground lines is recommended. If SYNC problems occur after powering up, please check the optical link first.

4. Port connector pin assignments

The modular port pin assignments (see table 5) are such that similar ports of different units may be connected back to back with reversed cable (RS-232 interfaces excepted). See figure 3 for the socket pin numbering convention used.

For 2-wire RS-485 links, I/O is through pin 1 and 2; the units can be connected to older VAD models using the older-style cable layout.

Pin	Port 1 (2)	Pin	Port 3
1	Audio in +	1	RS-485/422 in +
2	Audio in -	2	RS-485/422 in -
3	GND	3	RS-232 in
4	CC1out b	4	RS-232 out
5	CC1in (ref. to GND)	5	GND
6	CC1out a	6	GND
7	Audio out -	7	RS-485/422 out -
8	Audio out +	8	RS-485/422 out +

Table 5. Pin assignments of the modular electrical ports

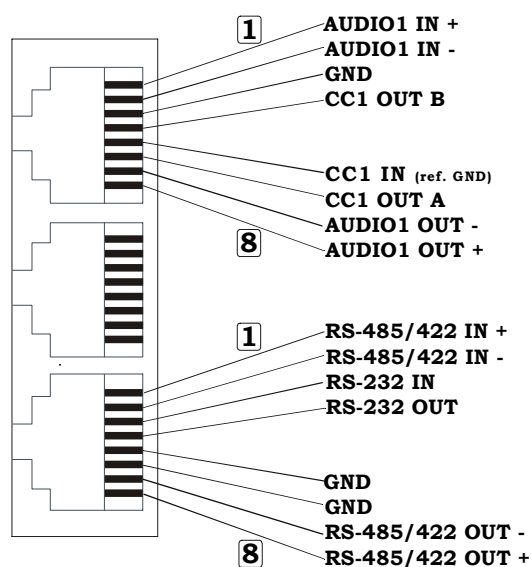


Figure 3. Socket pin layout; middle socket similar to topmost

5. Technical specifications

Type>	VAD 5310	VAD 5350	
Optical			
Number of fibres	1		
Fibre type	MM	SM	
Wavelengths	1310/850	1310/1550	nm
Optical budget	5*	>20 (26 opt.)	dB
Data rate	360 forward, 18 return		Mbit/s
Video			
No. of channels	1		
Video format	PAL/SECAM/NTSC		
In-/output level	1 (± 3 dB)		Vpp
DC restore (clamping)	On or off (software selectable)		
Bandwidth (-3 dB)	7		MHz
Sampling resolution	10-bit		
Differential gain	< 2		%
Differential phase	< 2		°
Group delay	< 50		ns
SNR	> 67		dBw
Audio			
Number of channels	2 (full duplex)		
Bandwidth	20 to 20 k		Hz
Sampling resolution	16 bit		
In-/output level	0 (+ 6 dBV max)		dBV
Tot. harmonic dist.	< 0.25 at nominal level		%
SNR	> 75		dBA
In-/output impedance	600 or > 50k in / < 50 out bal.		Ω
Data			
Number of channels	2 (full duplex)		
Data interface 1	RS-485 (2- or 4-wire) or RS-422		
Data interface 2	RS-232		
Data format	Asynchronous, serial		
Data rate	DC to 128 kbit/s** (1.5 MSsamples/sec)		
Contact Closure			
Number of channels	2 (full duplex)		
Input	+ 5 V pull-up, 10kΩ		
Threshold	0.75 (<1.5 kΩ)		V
Output	NO, fail-safe, potential-free		
Switch rating	2A @ 30 Vdc		
Management			
Network Management	through SNMP, Telnet, HTML (EB-2)		
Management vars.	Internal voltage & temperature, alarms		
LEDs	see table 2		
Environmental and Safety			
Operating temperature	-40 to 74 °C		
Full performance temp.	-15 to 55 °C		
Relative humidity	< 95 % (no condensation)		
Electrical safety	AL / IEC / EN 60950-1		
UL recognition file	E242498		
Laser safety	IEC 60825-1, IEC 60825-2		
EMC immunity	EN 55024, EN 50130-4, EN 61000-6-2		
EMC emission	EN 55022 (Class B) FCC 47 CFR 15 (Class B)		
Electrical			
Supply voltages	11-19		V _{DC}
Power consumption	≤ 5 (cont.)***		W
Current	0.6		A
Mechanical			
Connectors			
Optical	ST (5310)	FC (5350)	
Video	BNC 75 Ω		
Data, Audio, Contact Cl.	socket for RJ45 plug		
Dimensions	h x w x d = 128 x 35 x 190		
Weight (approx.)	450		
			mm g

*) Max. distance >2 km, depending on fibre dispersion

**) Manchester/biphase encoding: 64 kbit/s max.

***) Inrush current may be as high as 1 A

Table 6. VAD 5310/5350 technical specifications



6. Safety, EMC, ESD

General

The safety information contained in this section, and on other pages of this manual, must be observed whenever this unit is operated, serviced, or repaired. Failure to comply with any precaution, warning, or instruction noted in the manual is in violation of the standards of design, manufacture, and intended use of the unit.

Installation, adjustment, maintenance and repair of this equipment are to be performed by trained personnel aware of the hazards involved. For correct and safe use of the equipment and in order to keep the equipment in a safe condition, it is essential that both operating and servicing personnel follow standard safety procedures in addition to the safety precautions and warnings specified in this manual, and that this unit be installed in locations accessible to trained service personnel only.

Optelecom-NKF assumes no liability for the customer's failure to comply with any of these safety requirements.

UL/IEC/EN 60950-1: General safety requirements

The equipment described in this manual has been designed and tested according to the UL/IEC/EN 60950-1 safety requirements.

If there is any doubt regarding the safety of the equipment, do not put it into operation. This might be the case when the equipment shows physical damage or is stressed beyond tolerable limits (e.g. during storage and transportation).

Before opening the equipment, disconnect it from all power sources. The equipment must be powered by a SELV^{*)} power supply.

When this unit is operated in extremely elevated temperature conditions, it is possible for internal and external metal surfaces to become extremely hot.

Optical safety

This optical equipment contains Class 1M lasers or LEDs and has been designed and tested to meet IEC 60825-1:1993+A1+A2 and IEC 60825-2:2004 safety class 1M requirements.

Optical equipment presents potential hazards to testing and servicing personnel owing to high levels of optical radiation.

When using magnifying optical instruments, avoid looking directly into the output of an operating transmitter or into the end of a fibre connected to an operating transmitter, or there will be a risk of permanent eye damage. Precautions should be taken to prevent exposure to optical radiation when the unit is removed from its enclosure or when the fiber is disconnected from the unit. The optical radiation is invisible to the eye.

Use of controls or adjustments or procedures other than those specified herein may result in hazardous radiation exposure.

The installer is responsible for ensuring that the label depicted below (background: yellow; border and text: black) is present in the restricted locations where this equipment is installed.



The locations of all optical connections are listed in the Indications and Connectors section of this manual.

Optical outputs and wavelengths are listed in the Technical Specifications section of this manual.

EMC

The equipment has been tested and found to meet the CE-regulations relating to EMC, and complies with the limits for a Class B device, pursuant to Part 15 of the FCC rules.

These limits are designed to provide reasonable protection against interference to radio communications in any installation. The equipment generates, uses and can radiate radio frequency energy; improper use or special circumstances may cause interference to other equipment or a performance decrease due to interference radiated by other equipment. In such cases, the user will have to take appropriate measures to reduce such interactions between this and other equipment.

Any interruption of the shielding inside or outside the equipment could cause the equipment to be more prone to fail EMC requirements.

Non-video signal lines must use appropriate shielded CAT5 cabling (S-FTP), or at least an equivalent.

If system components, such as cabling (e.g. coaxial cable, data/audio/cc wiring) and/or the units, are used outdoors, ensure that **all** electrically connected components are carefully earthed and protected against surges (high voltage transients caused by switching or lightning).

ESD

Electrostatic discharge (ESD) can damage or destroy electronic components. Proper precautions should be taken against ESD when opening the equipment.

^{*)} SELV: conforming to IEC 60950-1, <60V_{DC} output, output voltage galvanically isolated from mains. All power supplies or power supply cabinets available from Optelecom-NKF comply with these SELV requirements.